DOCUMENT RESUME

ED 133 231 SE 021 906

AUTHOR Knapp, Clifford
TITLE Priority One: Environment. Open Lands and Wildlife, Teacher's Guide.
INSTITUTION Union Township Board of Education, N.J.
SPONS AGENCY Bureau of Elementary and Secondary Education (DHEW/OE), Washington, D.C.; New Jersey State Dept. of Education, Trenton. Div. of Research, Planning, and Evaluation.
PUB DATE [75]
NOTE 30p.; For related documents, see SE 021 898-905; Not available in hard copy due to copyright restrictions

EDRS PRICE MF-$0.83 Plus Postage. HC Not Available from EDRS.
DESCRIPTORS *Ecology; *Environment; Environmental Education; Instructional Materials; Land Use; *Natural Resources; *Secondary Education; *Teaching Guides; Units of Study (Subject Fields); *Wildlife Management
IDENTIFIERS Elementary Secondary Education Act Title III; ESEA Title III

ABSTRACT

Material in this teaching guide includes: (1) an introduction to the unit; (2) a discussion of the sections of the unit; (3) instructional objectives; (4) suggestions for use of filmstrips, worksheets, reference materials, and activity cards; and (5) an outline of the unit. These materials have been validated as successful, cost-effective, and exportable by the standards and guidelines of the U.S. Office of Education. (RH)

**********
* Documents acquired by ERIC include many informal unpublished *
* materials not available from other sources. ERIC makes every effort *
* to obtain the best copy available. Nevertheless, items of marginal *
* reproducibility are often encountered and this affects the quality *
* of the microfiche and hardcopy reproductions ERIC makes available *
* via the ERIC Document Reproduction Service (EDRS). EDRS is not *
* responsible for the quality of the original document. Reproductions *
* supplied by EDRS are the best that can be made from the original. *
**********

ED133231

# PRIORITY One
## environment

U S DEPARTMENT OF HEALTH
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

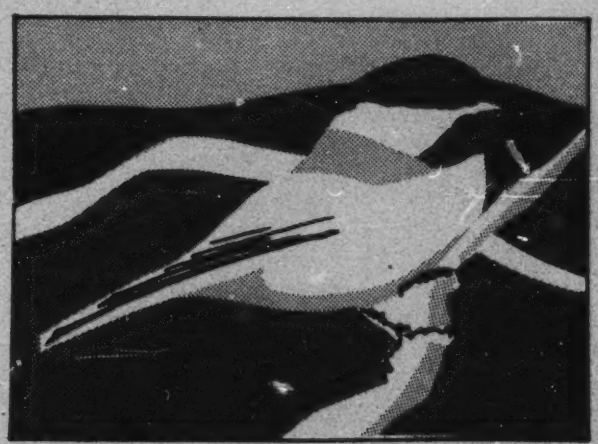
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

Teacher's Guide

PERMISSION TO REPRODUCE THIS COPYRIGHTED MATERIAL BY MICROFICHE ONLY HAS BEEN GRANTED BY

Charles Murphy

TO ERIC AND ORGANIZATIONS OPERATING UNDER AGREEMENTS WITH THE NATIONAL INSTITUTE OF EDUCATION. FURTHER REPRODUCTION OUTSIDE THE ERIC SYSTEM REQUIRES PERMISSION OF THE COPYRIGHT OWNER.



SE 021 906

# OPEN LANDS AND WILDLIFE

# PRIORITY ONE ENVIRONMENT

**POLLUTION CONTROL EDUCATION CENTER**
Township of Union Public Schools
Union, New Jersey

**OPEN LANDS AND WILDLIFE**

| | |
|---|---|
| **Project Director** | **Charles Murphy** |
| **Art Director** | **Milton Knobler** |
| **Production Coordinator** | **Patricia McCutcheon** |
| Author: | Clifford Knapp |
| Contributing Writer: | Patricia McCutcheon |
| Teacher's Guide: | Clifford Knapp<br>Patricia McCutcheon |
| Graphics and Illustrations: | Edward Tittel |
| Photography: | Clifford Knapp<br>Vera Knapp |
| Contributing Photographers: | Fred Barbi<br>Eric Rasmussen<br>Ralph Smith |
| Compositor: | Joan Wirth |
| Technical Consultant: | Florence Porcello, Statistical Analysis |
| Superintendent of Schools: | Robert Fleischer |
| Title III Coordinator: | James Caulfield |
| New Jersey State Department of Education<br>Office of Program Development: | Robert Ward<br>Evelyn Ogden |

Copyright © by Pollution Control Education Center, Township of Union Public Schools, Union, New Jersey. All Rights Reserved. Printed in the United States of America. No part of these publications may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior written permission of the Pollution Control Education Center. Copyright is claimed until December 30, 1980.

The materials presented herein were prepared pursuant to a Grant from the New Jersey State Department of Education under provisions of the Elementary and Secondary School Act of 1965, Title III.

# OPEN LANDS AND WILDLIFE

CONTENTS


INTRODUCTION TO THE UNIT

Open Lands and Wildlife 2

SECTION I

Attitudes and Values 5

SECTION II

Finding Out by Looking Closely 10

SECTION III

Learning About Ecology 14

SECTION IV

A Key Controversy: Land Use 21

SECTION V

How You Can Help 26

KIT INVENTORY FOR OPEN LANDS AND WILDLIFE 30

ANSWERS TO THE UNIT TEST 30

UNIT SCHEDULE SHEET FOR OPEN LANDS AND WILDLIFE Inside Back Cover

## INTRODUCTION TO THE UNIT
## OPEN LANDS AND WILDLIFE

**Open Lands and Wildlife** presents and encourages consideration of wildlife problems that have occurred due to environmental change. Change is the normal course of events on our planet, but the rate at which it now occurs is a concern to ecologists and environmentalists. The survival of countless numbers of living species on this Earth becomes less and less possible as diverse life-support systems are crowded out by human population, pollution, and consumptive land uses.

Students should not be led to believe that solutions to wildlife problems, or to any environmental issue, can be easily determined. As with any controversy involving different values, there is often confusion about what is best and right. We as teachers may also have to live with incomplete solutions to wildlife problems and environmental change. But it would be a mistake to attempt to over-simplify the problems or offer ready-made solutions. The teacher's role in this curriculum unit is to provide a setting for studying these issues as objectively as possible and to help the students evaluate facts as well as the emotional arguments representing different points of view. Debate and serious discussion should be encouraged. Disagreement among the students on particular viewpoints can be regarded as helpful if it motivates them to learn more. Teachers too should rightfully express their opinions throughout the unit.

To be sure, some wildlife questions are more controversial than others. Problems of endangered wildlife and the changing uses of our land are very important topics for students to study. Human beings have made mistakes in handling wildlife decisions. Wildlife values often take second place behind economics, human convenience, or politics. Maintaining the existence of wild species and preserving open lands as their habitat are regarded by all ecologists as priorities inseparable from and necessary to the quality of human life. Therefore, these priorities are emphasized in this unit.

This unit has been designed so that students can become involved both mentally and physically in the wildlife and land use issues. Even if your school is in the heart of a large city, your students can participate in the activities. Additional information can be found through reading, talking to people, viewing films and television, and by direct observation of animals. **You as the teacher should be comfortable not to know all the answers to the questions that will arise as you develop this unit.** No one knows all the answers anyway, and there is truly no unanimous agreement on most of them.

**Section I**

**Attitudes and Values** encourages the students to discuss their present feelings and opinions on key ecological issues of our time as they react to the attitudes and values expressed in text and in the first filmstrip.

| | |
|---|---|
| Section II | **Finding Out by Looking Closely** involves the individual student in observation and scrutiny of living things and their environments and provides him with the opportunity to share and evaluate his conclusions with others. |
| Section III | **Learning About Ecology** presents basic ecological principles in the form of a story about a deer population and then elaborates the principles in two objective articles and a series of overhead transparencies. |
| Section IV | **A Key Controversy: Land Use** gives information on peoples' needs and uses for land today, evaluates the growing competition between people and other species for open space, and provides for assessment of the open space available locally. |
| Section V | **How You Can Help** describes the efforts and the results produced by a group of ecologically-minded students and identifies a series of activities that the students as individuals or as an entire class can elect to do. Continuing use of the ten activity cards as extensions to the unit is also pertinent to this section, and beyond. |

## INSTRUCTIONAL OBJECTIVES

The developers of *Priority One: Environment* have recognized student input as essential to structuring significant learning experiences. The materials in this unit, *Open Lands and Wildlife*, have been student and teacher-tested in the development stages. The educational objectives of the unit, as specified below, are correlated with a twenty-question multiple-choice test. It has been provided for your use on two of the Ecomasters. Answers to the test appear on page 30 of this Guide.

We recommend that you administer the unit test to each of your students before and after using this unit so that you can measure the growth in learning that the fieid-testing of each *Priority One* unit has shown to take place. Further inquiry concerning evaluation procedures and designs can be made directly to the **Pollution Control Education Center, Union Township Board of Education, Union, New Jersey.**

An the end of this unit, the student will be able to:

1. Identify at least ten animal species that are in danger of extinction.

2. Describe three ways that people have contributed to the extinction of animal populations.

3. Describe three ways that people have contributed to the increase of animal populations.

4. Describe in a paragraph how the United States has attempted to solve specific wildlife and land use problems.

5. List at least eight characteristics of birds useful in their identification.

6. Describe some of the effects of introducing certain animals into new areas of the world.

7. Accurately define at least twelve words from the ecology glossary.

8. Describe in writing at least six physical and behavioral characteristics of an animal selected for observation.

9. Demonstrate an awareness and concern for endangered and threatened wildlife and changing land use.

10. Show a tolerance for other people's values about wildlife and land use because they understand how complex these issues may be.

11. Accurately observe and record animal behavior and explain what impact on the environment this observed behavior has.

12. Design and carry out scientific experiments to learn more about wildlife and land use.

13. Describe how to improve a habitat so that particular animals will be able to increase in number.

14. Correctly match specific animals with their evidence clues.

15. Analyze a wildlife or land use issue so that the different points of view can be identified.

16. Write a law to assure that a specific wildlife or land use problem will be solved or ameliorated.

17. Demonstrate how to find out the facts involved in a wildlife or land use issue.

## SECTION I ATTITUDES AND VALUES

### FOCUS

The aim of this introductory section is to arouse discussion and evoke many questions about the values of wildlife and open space. The components of the section have been designed to motivate a values-quest by presenting a set of wildlife problems as well as a range of existing attitudes about the problems. It is suggested that the students read both the **Preface to the Unit** and the article **Dead or Alive, A Story**, then respond to the set of wildlife problems given on **Worksheet 1** before they see and discuss **Filmstrip 1, Why Wildlife?**

As soon as you set a target date for beginning this unit, you might like to start gathering reference materials of several kinds. The list of films at the end of your Guide and the list of addresses at the end of the **Student Resource Booklet** provide you with suggested sources of information. Also, contemporary newspapers and magazines often contain articles about wildlife and land use. You might like to order the recommended supplemental films far enough in advance to allow for flexibility in planning.

Although this unit has been designed to be used for a minimum of five days, or lessons, many students (and teachers) will want to become involved for two or even three weeks. Therefore, the unit has been designed to contain a sufficient number of individualized and group exploratory activities that will enable you to extend the time if you wish to do so.

### THE MATERIALS PROVIDED

| Student Booklet | Audio-Visual Materials | Ecomaster Activities | Extension Activities |
|---|---|---|---|
| **Preface to the Unit**<br><br>**Dead or Alive, A Story** | **Filmstrip 1**<br>Why Wildlife?<br><br>**Audio Cassette, Side A** | **Worksheet 1**<br>Attitudes and Values Assessment (2 pages) | **Activity Card 1**<br>Learning About Endangered Species |

## MAKING THE MATERIALS WORK, SUGGESTIONS FOR THE TEACHER

**Booklet Article – Preface to the Unit**

These first pages of the **Student Resource Booklet** are to be reacted to. Your students may never have thought that as long ago as 1892 naturalists like the famed Francis Parkman were lamenting the loss of wild species, losses attributable not to natural events but to the impact of people. Also, the students may not care! Encourage them to evaluate the quote by giving their opinions about it and by answering the questions which follow it. You might like to ask them how the feelings expressed by the quote would change if words like "succumbed" and phrases like "hushed their savage music" were "dropped dead" and "stopped their howling."

Additional analysis of the subjective point of view can be done by using the quotes below. You can either read them orally at this time for immediate student reaction or use one or both of them later for a written homework assignment.

1. Describe in a paragraph how you feel after reading the following quote from an article by Jim Lockart, "The Prairie Boomer," *Outdoors in Illinois* Fall and Winter, 1960 Vol. 7, No. 2. Department of Conservation, Division of Education, Springfield, Illinois.

> *To the Editor of the Chicago Tribune:*
>
> *I hereby challenge any man in America to shoot prairie-chickens against me in the field, during the month of November, to shoot for one or two weeks, on the same ground, for a stake of from $100 to $500 a side. The man who kills the most during the time specified to take all the game and the stakes.*
>
> *A. H. Bogardus*
>
> *Chicago, September 29, 1869*

2. In the following paragraph, underline all the words which carry a strong feeling or reveal the writer's values. Can you guess what organization might have written this? (The Humane Society of the United States)

> *America's animals are in trouble. They are being clubbed to death and caught in painful steel-jaw traps in order that American women can wear their fur. They are being imprisoned in tiny cages at gas stations, bars, and roadside zoos. They are being killed by our federal government at the insistence of ranchers. And our cats and dogs are suffering by the millions because there are far too many of them to be cared for as pets.*

Ask your students if they can name any extinct species. If their list is a comprehensive one, get one or more students to order the list in terms of when each species existed, where it was located, and the probable reason for its extinction. This can be shared with the entire class at a convenient later time.

**Filmstrip – Why Wildlife?** The filmstrip, **Why Wildlife?** summarizes the key wildlife and open space questions and begins to provide background information about ecology. It is appropriate for the teacher in subsequent discussion of the filmstrip to relate wildlife to each student both directly and indirectly, by asking the students how they use the outdoors for fun, whether their parents' and grandparents' occupations are related to wildlife, and how many of them may have seen the animals shown in the filmstrip.

The filmstrip begins with reference to these key issues: predator control, importation of exotic species, hunting permits on wildlife refuges, and the use of pesticides that are lethal to wild animals. It then defines wildlife in terms of commercial and noncommercial values. The noncommercial values are further described to be recreational, aesthetic, and scientific.

The students are informed in the filmstrip that there are at least three answers to the question, "Why wildlife?" They are these:

1. Studying wildlife informs us about the interrelation and interdependence of all living things.

2. Ecology is a relatively young science, and there is much we can learn from it that applies to people as well as to animals in the wild.

3. We are just beginning to realize that a species diversity on our planet is best in the long run for people.

Next, the beaver and the deer are given as examples of species that were able to adapt to environmental impact caused by man; the buffalo and the prairie dog are shown as examples of wild species that could not compete successfully with us for food or territory. You might like to end the lesson with discussion of the filmstrip's concluding description of man, the super-predator.

Also find out whether the students can name any more of the living species in the United States which are now officially regarded by the Department of Environmental Protection as **endangered** besides those which have been illustrated on page 2 of their booklets, which represent the endangered in four categories: **Fish, Reptiles and Amphibians, Mammals, and Birds**. For your convenience, the complete list is given at the end of Section I of this Guide.

### Activity Card 1 – Learning About Endangered Species

You might like to mention to your class at this point in the discussion that there is a set of activity cards for use with this unit. Each of the ten cards, your students should know, is available for their further exploration of topics that will come up during the course of the unit. Activity Card 1 directs the student's attention to doing research about endangered species and suggests some sources of information. Descriptions of relevance and suggestions for using the other activity cards appear in this Guide at the end of each section in which the activity cards are appropriate extensions.

### Booklet Article – Dead or Alive, A Story

The students next are to read the **Dead or Alive** story and, again, react to the questions. The teacher can read the story aloud or ask for a good-reading volunteer to do it. Read the last paragraph again and make the point that the future of wildlife and open lands is really up to the students now and in the future. They can make a difference if they are knowledgeable, concerned, and motivated to act. Allow enough time for the students to share their responses as a whole class or in small groups before handing out Worksheet 1.

### Worksheet 1 – Attitudes and Values Assessment

The teacher's role in using the **Attitudes and Values Assessment** should be one of clarifier and guide, not final-decision maker about what is correct. It is suggested that you provide no information about the issues at this point. You might introduce the activity by saying something like this, "OK, you've heard a number of opinions about wildlife and open space issues, now let's see where you really stand.' Read the directions together and do an example or two on the chalkboard or overhead projector. You can use the example below first, or any of the twelve value positions identified on the assessment Ecomaster.

Point out that people rarely stand at the ends of these lines, which should be regarded as measurements between two opposing poles. Emphasize that the mark should not be placed in the exact middle if the students are to commit themselves to a point of view. Have a few students come to the chalkboard or the overhead projector and actually place their marks on the line, each giving a reason for the position of his mark. You will usually find marks distributed along most of the continuum on many issues. After the students have completed the **Assessments**, they may be collected by the teacher or kept in a notebook for future reference.

## OFFICIAL LIST OF ENDANGERED FISH AND WILDLIFE OF THE UNITED STATES

### Fish

Shortnose sturgeon
Longjaw cisco
Lahontan cutthroat trout
Piute cutthroat trout
Greenback cutthroat trout
Gila trout
Arizona (Apache) trout
Humpback chub
Mohave chub
Pahranagat bonytail
Moapa dace
Woundfin
Colorado River squawfish
Kendall Warm Springs dace
Cui-ui
Devil's Hole pupfish
Comanche Springs pupfish
Tecopa pupfish
Warm Springs pupfish
Owens River pupfish
Pahrump killifish
Big Bend gambusia
Clear Creek gambusia
Pecos gambusia
Unarmored threespine stickleback
Gila topminnow
Fountain darter
Watercress darter
Maryland darter
Blue pike
Okaloosa darter

### Reptiles and Amphibians

American alligator
Blunt-nosed leopard lizard
San Francisco garter snake
Puerto Rican boa
Santa Cruz long-toed salamander
Texas blind salamander
Houston toad
Desert slender salamander

### Birds

Hawaiian dark-rumped petrel
California least tern
Hawaiian goose (nene)
Aleutian Canada goose
Laysan duck
Hawaiian duck (koloa)
Mexican duck
Brown pelican
California condor
Florida everglade kite (snail kite)
Hawaiian hawk (io)
Southern bald eagle
American peregrine falcon
Arctic peregrine falcon
Attwater's greater prairie chicken
Masked bobwhite
Whooping crane
Yuma clapper rail
California clapper rail
Light-footed clapper rail
Hawaiian gallinule
Hawaiian coot
Hawaiian stilt
Puerto Rican plain pigeon
Puerto Rican parrot
Ivory-billed woodpecker
Red-cockaded woodpecker
Hawaiian crow (alala)
Small Kauai thrush (puaiohi)
Large Kauai thrush
Molokai thrush (olomau)
Nilhoa millerbird
Kauai oo (oo aa)
Crested honeycreeper (akohekohe)
Hawaii akepa (akepa)
Maui akepa (akepuie)
Oahu creeper (alauwahio)
Molokai creeper (kakawahie)
Akiapolaau
Kauai akialoa
Kauai and Maui nukupuus
Laysan and Nihoa finches
Ou
Palila
Maui parrotbill
Bachman's warbler
Eskimo curlew
Mississippi sandhill crane
Puerto Rican Whip-poor-will
Santa Barbara song sparrow
Kirtland's warbler
Dusky seaside sparrow
Cape Sable sparrow

### Mammals

Hawaiian hoary bat
Indiana bat
Delmarva Peninsula fox squirrel
Morro Bay kangaroo rat
Salt marsh harvest mouse
Eastern timber wolf
Red wolf
San Joaquin kit fox
Black-footed ferret
Florida panther
Florida Manatee (sea cow)
Key deer
Columbian white-tailed deer
Sonoran pronghorn
Utah prairie dog
Northern Rocky Mountain wolf
Eastern cougar

## SECTION II FINDING OUT BY LOOKING CLOSELY

### FOCUS

In this section the students will do some careful observation and hard thinking. They will become amateur wildlife biologists and detectives, learning to use clues left by animals to understand the meaning of some animal behaviors. **A Woodland Mystery** simulates an actual observation of the famous naturalist, Ernest Thompson Seton, who spent long hours observing and sketching wild animals in northern United States and Canada. If time, place, and season permit, you are encouraged to take your students outdoors in order for them to set up their own "mysteries," or put the **Hints for Observing Birds** into practice, or to use two of the Activity Cards, 2 and 3, which provide for insect study.

### THE MATERIALS PROVIDED

| Student Booklet | Audio-Visual Materials | Ecomaster Activities | Extension Activities |
|---|---|---|---|
| **A Woodland Mystery**<br><br>**Hints for Observing Birds**<br><br>**Wildlife Detective Game: The Evidence** | **Wildlife Detective Game: The Culprit Cards** | **Worksheet 2**<br>Observation Guide for Animal Study<br><br>**Worksheet 3**<br>Wildlife Detective Game: The Clues | **Activity Card 2**<br>Counting the Animals in Soil Samples<br><br>**Activity Card 3**<br>How Do Insects Move and Navigate?<br><br>**Activity Card 4**<br>Observing the Behavior of People<br><br>**Activity Card 5**<br>More Uses for the Wildlife Detective Materials |

### MAKING THE MATERIALS WORK, SUGGESTIONS FOR THE TEACHER

**Worksheet 2 – Observation Guide for Animal Study**

Start Section II by handing out copies of the second Ecomaster and encouraging your students to choose any wild or domestic animal they will be able to observe at home or after school. This will enable them to share their findings later. You can also use the **Observation Guide for Animal Study** to examine any animal which you or they may bring into the classroom. If live animals are not available for observations, show a film about animals in the wild. Show it without sound, so that the narration does not influence the observations.

This activity may be the first opportunity your students have ever had to observe an animal carefully in detail. Guide them after they have had a chance to try it on their own. (The value of a film is that it can be repeated with or without the sound to check accuracy.) Caution the students not to attribute human thoughts and emotions to animals. They should be able clearly to separate what is actually observed and what is imagined about the animal. For example, we can observe the wagging tail of a dog, but we can only imagine that the dog experiences the kind of happiness that humans do. Some of the information on the sheet will have to be discovered through reading and asking knowledgeable people. These are valid ways of learning too, and should be encouraged. Another suggestion for you is to take a trip to the zoo and do an on-site observation study there, followed by research in the library.

Notice that Worksheet 2 is structured so that questions 1, 2, and 3 can be answered directly on the sheet. The students are also informed that they will need additional paper for the record-keeping that pertains to questions 4 through 10. You can either provide them with a format for ecology record-keeping that you would like them to use, or encourage them to gather and record their data in whatever ways they can imagine would be appropriate.

**Booklet Article – A Woodland Mystery**

Use of this booklet article should probably be a whole-class activity, with everybody reading the animal evidence and interpreting and explaining what is seen as they go from question 1 to question 11 of the illustrated narrative. If the students are intrigued by this activity, you can read some sections from Seton's writings to them, especially *Ernest Thompson Seton's America* by Farida A. Wiley (ed.) Garden City, New York: Dolphin Books, Doubleday and Company, Inc., 1963. Take the class outside to allow them to set up their own mysteries, scratched in the soil or marked with chalk on blacktop. Small groups might like to set up clues and write a story of what could have happened at the scene. The groups can switch locations to try to figure out each others' mysteries.

**Booklet Article – Hints for Observing Birds**

Fortunately for young ecologists, birds can be observed everywhere. With your class, go over the directions and hints for observing birds in the **Student Resource Booklet**. Birds can be observed from the classroom window, on the way to and from school, or on weekends. Would you like to plan a field trip with a member of the local Audubon Club? Many of the members are very willing to lead a bird walk, especially for those students who are really interested. Your students will enjoy asking an Audubon Club member for hints that he or she has found useful in observing and attracting birds. Ask the students if any of them has a friend or relative whose hobby is bird-watching. The friend or relative may be willing to visit your classroom and give a talk.

If you encourage your students to do projects, you can suggest that they report on their own bird observations, or on such things as types of bird houses, nests or feeders, and migration habits.

**Booklet Article and Worksheet 3 – Wildlife Detective Game**

Your students will need to use two components of the unit simultaneouslv for the first part of the culminating activity of Section II, both the booklet article and the third worksheet, **Wildlife Detective Game: The Clues**. You can initially have the students guess, if you wish, what animals might have caused the ten samples of "evidence" as shown on pages 8 and 9 of their booklet and guess how or why the evidence came about before handing out copies of the Ecomaster. The worksheet gives verbal descriptions of what the booklet shows, but does not name or show any of the animals that caused the samples of evidence. The object of the game at this point is for each student to match what he sees in his booklet, **evidence samples** 1 to 10, with the verbal **clues** 1 to 10, on Worksheet 3.

**4 Sets of Wildlife Detective Cards: The Culprits** For the second part of the Detective Game activity, divide the class into four equal groups and distribute one set of cards per group. Now the students are carefully to examine the Culprit Cards. They can take turns sharing the sketches and matching the evidence and the clues with the correct animal. The first group that can accurately coordinate all ten samples of evidence with the clues and with the animal culprits will be the winners of the game. **(Note: Some teachers have found it helpful to prepare several sets of Culprit Cards from the two Ecomasters on which they are provided and then shellac, mount, or laminate them for the first and all subsequent uses.)**

| ANSWERS TO THE ANIMAL DETECTIVE GAME | | | |
|---|---|---|---|
| Item | Booklet Illustration | Worksheet 3 | Culprit Card |
| Dutch Elm Disease | 1 | 3 | 2 |
| Mud Dauber Nests | 2 | 6 | 5 |
| Gypsy Moth Egg Masses | 3 | 9 | 10 |
| Mouse Damage on Apple Tree | 4 | 1 | 4 |
| Owl Pellet | 5 | 8 | 3 |
| Deer Browse | 6 | 2 | 9 |
| Earthworm Castings | 7 | 5 | 7 |
| Grasshopper Impaled | 8 | 4 | 1 |
| Sapsucker Holes | 9 | 10 | 8 |
| Bear Mark | 10 | 7 | 6 |

**Activity Card 2 – Counting the Animals in Soil Samples**

One type of insect that your students will discover in the samples of soil that they investigate is known as the *springtail*. If the students obtain their samples from varying depths of soil, they may be able to make the observation that different species of springtails are found at different depths: The species that occur on top of the soil often have long antennae and springs and fairly good eyes. Those living in the upper layers of the soil tend to have shorter antennae and springs, and those living deep in the soil are generally white in color, blind, have short antennae, and no springs at all.

Encourage students who elect this activity to prepare slides and show their classmates what animals they found in the samples of soil, giving a probable count for each type. If you set a target date for everybody's follow-up of this activity and provide the microscope, your students will enjoy comparing their results in terms of the depth of the sample taken, the animal "count," etc.

**Activity Cards 3 and 4 – How Do Insects Move and Navigate? and Observing the Behavior of People**

Both of these activities can be regarded and used either as extensions of the second worksheet, **Observation Guide for Animal Study** or as separate investigations. In either case, the entire class will benefit from presentations made by individual students concerning the **subjects** of their study. They will be able to determine what information the student observer was able to see and gather, how he classified or interconnected that information in order to present it, and what significance he gave to his "findings" in behavioral terms.

**Activity Card 5 – More Uses for the Wildlife Detective Materials**

Additional suggestions for using the Wildlife Detective materials are listed on this activity card. If your students would like to make up a whole new set of **evidence samples**, **verbal clues**, and **culprit cards**, (or something comparable) you can refer them to these helpful sources of information:


1. Comstock, Anna Botsford. *Handbook of Nature-Study*. Ithaca, New York: Comstock Publishing Associates A Division of Cornell University Press. 1961.

2. Palmer, E. Laurence. *Fieldbook of Natural History*. New York: McGraw-Hill Book Company, Inc. 1949.

3. Schwartz, Charles W. and Schwartz, Elizabeth R. *The Wild Mammals of Missouri*. Kansas City, Missouri: The Curators of the University of Missouri. 1964.

## SECTION III LEARNING ABOUT ECOLOGY

### FOCUS

In this section the students will learn basic ecological principles and terms and continue to investigate ecology through experimentation. The story, **A Year in the Life of a Twin Fawn**, illustrates ecological principles in the context of a deer population. The students will be led to understand that key terms—such as *habitat, niche, competition*, and *carrying capacity*—apply not only to a population of white-tailed deer during the course of a typical year, but to all other species as well.

The four overhead transparencies for use in this section and the **Ecology Glossary** which has been provided on pages 34 and 35 of the **Student Resource Booklet** will enable you to clarify and reinforce the important concepts. As Section III evolves, your students should indicate some mastery of the key concepts and terms by using them both in class discussions and in written assignments or reports. As the teacher you are in the position to reinforce their understanding by frequent use of an ecologically-based vocabulary. For example, encourage them to see human impact as a *biological control* on wildlife populations such as deer and ask them to describe how a woodland *ecosystem* would be affected by over-browsing.

You will find it helpful to do some advance planning for the Ecomaster Activities of this section. The Guide suggests below how you can obtain the pill bugs and sow bugs which you will need for Worksheet 4, and suggests here that you prepare a batch of toothpicks by dying them for Worksheet 5.

### THE MATERIALS PROVIDED

| Student Booklet | Audio-Visual Materials | Ecomaster Activities | Extension Activities |
|---|---|---|---|
| **A Year in the Life of a Twin Fawn**<br><br>**Ecology: Principles and Problems**<br><br>**The Tools of Wildlife Management** | **Overhead Transparencies**<br>Habitat, Range, and Territory<br><br>Biotic Community<br><br>Producers, Consumers, and Decomposers<br><br>Ecological Balance | **Worksheet 4**<br>Where Do Pill Bugs and Sow Bugs Live? (2 pages)<br><br>**Worksheet 5**<br>Toothpick-Eating Animals | **Activity Card 6**<br>Visiting a Hatchery<br><br>**Activity Card 7**<br>Doing Research on Exotic Species<br><br>**Activity Card 8**<br>Judging the Laws That Protect and Preserve |

## MAKING THE MATERIALS WORK, SUGGESTIONS FOR THE TEACHER

**Booklet Article – A Year in the Life of a Twin Fawn**

You will probably want the students to read this story at home in order for you to begin Section III by discussing the four follow-up questions on page 13 of their booklets. You can then check for careful reading of the story, if you wish, by asking questions such as these:

1. In the story, why were there more deer by 1930 than when the Indians had roamed the forest?

2. How were the young twins *adapted* for survival?

3. What was the *range* of this deer herd?

4. What *biological controls* had impacted upon the deer population in the course of a single year?

5. What was the reduction in the population of the entire herd by the end of the year of the story? What was the reduction in the *biomass* of the male twin by the end of the year?

Some sections of the story are appropriate for oral reading, in order to motivate the students to give their interpretations and opinions. Encourage them to explain the meanings of these passages, for example:

1. One of the natural causes of death in the wild is starvation. . .Competition for space and food is a fact of life which is shared by all living things.

2. Does it seem strange that a plentiful food supply one year can mean a shorter life span for each deer the following year?

3. No one knew what adventures would be ahead for the lone twin during the coming year. Would he live until his second birthday?

Be sure to refer to the **Ecology Glossary**, and have your students define the terms in the context of the deer story. If they enjoy the story, the glossary will become meaningful for them, and they will probably remember the terms better. It is reasonable to expect the students to become able to cite examples for the terms, based on materials in this unit such as the fawn story and on their own investigations and experiences.

Information about the white-tailed deer is plentiful. Some cogent points about this species that you might like to make for your class as you discuss the story with them are these:

1. The white-tail is our nation's most abundant big-game animal.

2. The abundance of the white-tail is basically due to three factors:

   a. Its acute senses of smell and hearing (not of sight, by the way) and its abilities to run swiftly and to leap over obstacles like shrubs or fences as high as nine feet have enabled it to elude hunters quite successfully.

   b. It has adapted well to diverse types of habitat, from woodlots and farm areas to swamps, deserts, and mountains.

   c. Game management practices and legal controls on hunting over the years have enabled the population to flourish—to the extent that many wildlife managers today do approve of monitored hunting in areas where the white tail's population has become too dense for its own well-being.

**4 Overhead Transparencies (Habitat, Range, and Territory – Biotic Community – Producers, Consumers, and Decomposers – Ecological Balance)** The overheads can be shown separately or together in the sequence suggested here and listed on the Unit Schedule Sheet. The **Habitat, Range, and Territory** overhead illustrates land-use differences among particular animals' living or nesting quarters, differences in the amount of terrain that is lived in by these animals, and examples of animals that often defend a portion of the range that they have staked out for themselves. Be sure the students understand that it is *territory* which an animal fights to maintain, frequently against intrusion by one of his own species. Additional examples of territory-fighters are the bear, the lion, and the wolf. Do your students think that people and their domesticated pets ever experience territorial protectiveness?

**Biotic Community** shows the relationships that can exist among plants, animals, and nutrient materials in a typical forest wildlife community. Make the point as you show the overhead that plant and animal life is interconnected and interdependent. Each species has a function in its own community, or *ecosystem*, and a role to play, called its *niche*, in the overall pattern of life.

Point out that there are three major types of ecosystems, freshwater, marine, and terrestrial. Any pond or lake is a freshwater ecosystem. A terrestrial, or land-based ecosystem, can be in a forest, as the overhead illustrates, in a desert, on a prairie, etc. Even a vacant city lot is a kind of ecosystem. Explain that an ecosystem can be big or small, simple or complex. It can last for many years or be short-lived. Whatever kind it is or wherever it is, an ecosystem is a relationship among living things and environment, a relationship that enables a community of living things to survive.

Use the third overhead, **Producers, Consumers, and Decomposers**, to illustrate these common denominators of all ecosystems. Explain that green plants, called *producers*, take energy from the sun and use it to provide both food and oxygen for animal life. Plant-eaters, like most birds and all deer, feed either upon the fruits and seeds of plants or upon the plants themselves. You can mention, if you wish, that plant-eating animals are gen-

erally identified by ecologists as *first-order consumers* and plant and animal-eating animals as *second-order consumers*. It is the role of the *decomposer* in every ecosystem, specifically the bacteria and the fungi, to break down dead plant and animal matter into simple chemicals and gases that can be used again. The decomposer returns, or recycles, nutrients in every ecosystem's *food web*. Thus, in the scheme of things on our planet, bacteria and fungi act as recyclers in the planet's vastly complex *food chain*. They have a vital niche.

The fourth overhead, **Ecological Balance**, isolates one of the predator-prey relationships operating in the world today in order to show as simply as possible that a complex set of *limiting factors* impinge upon this relationship and on all the environmental interdependencies. Students should understand that the phenomenon everybody calls "the balance of nature" is a continuously changing spectrum in which many diverse life forms are struggling against each other, against *environmental resistance*, and against the super-predator, man, in order to survive.

Have the students give their ideas on how these limiting factors would impact upon a population of pheasant: **food, cover, disease, weather**, and **nesting**. You will probably have to explain the three other limiting factors on the pheasant's side of the balance: **predators, buffer species**, and **bag limit**. Not only the fox preys on the pheasant; other predators include the oppossum and the bobcat, for example. A plentiful supply of other species for these predators to eat, such as mice, rabbits, and chipmunks, can serve as a buffer for the pheasant population. Bag limits, of course, are set by people in order to regulate the number of pheasant that hunters can take. Next encourage the students to give their ideas about what is shown on the fox's side of the balance: **disease, hunting, dens, cover, food**, and **competitors**.

**Worksheet 4 — Where Do Pill Bugs and Sow Bugs Live?**

To continue this section with the activity **Where Do Pill Bugs and Sow Bugs Live?** you need to obtain some. Once you know what these creatures look like and where they can be found, it is often possible for you to gather as many as you need without cost. The best place to look is in moist, shaded areas such as under rocks and logs. Look also where people have dumped concrete, shingles, cardboard and other debris, which create ideal habitats for these animals. Pill bugs and sow bugs consume decaying vegetation, and therefore are easily found in any rich, damp, humus. If you are unable to find pill bugs or sow bugs locally, you can order them from a biological supply house.

Usually, three or four of these animals per student team is sufficient. Remember that one purpose of this activity is to have the students accurately predict where to find these animals and then go out to test their predictions. Once their hunt starts, you may end up with more animals than you can use. If you like, you can keep them from year to year in a terrarium. Feed them bran, and supply them with enough moisture by occasionally wetting a small piece of paper toweling and putting it into the terrarium. Replace the toweling when it dries.

**Worksheet 5 – Toothpick-Eating Animals**

Use of this Ecomaster, which is designed to teach students about the color adaptations of animals, is appropriate in this section of the unit at any time after the fawn story has been read and discussed. Since Section III is really the crux of the unit, in the sense that the ecological concepts of the unit are detailed here, you might want to use class time for the development of both of the Ecomaster activities. If you do not have that much time, you can divide the class into two groups. Group 1 can perform the activity of Worksheet 4, and Group 2 the activity of Worksheet 5. Then the two groups can share their findings with each other.

In either case, sets of wooden toothpicks must be prepared by dying them with food color or Easter egg dye. Use at least fifty colored toothpicks for the experiment and keep ten extra in case any are lost. Put about fifty undyed toothpicks with the colored ones. Select a grass-covered location outside and mark off a rectangle about 2 feet by 6 feet in size. Mark the boundaries with string and little sticks such as popsicle sticks. This size plot is suitable for as many as eight or ten students and a total of 100 toothpicks.

Before the experiment begins, select a few student assistants to seed the 100 toothpicks within the plot. The colors should be mixed randomly, and the toothpicks should be placed upright in the ground with most of their lengths exposed. When all the toothpicks have been placed in the plot, assemble the students along the string boundaries and give them their copies of Worksheet 4.

**Booklet Article – Ecology: Principles and Problems**

The issues that are identified and discussed in this article are listed on page 14 of the **Student Resource Booklet**. They are also listed for your convenience below:

1. What animals are in danger of becoming extinct, and why?
2. Have any threatened species been able to restore their populations? Have people aided the threatened species, and if so, how?
3. Does the paying of money to kill predators help to reduce their populations?
4. Are hunting and trapping ecologically sound practices?
5. Is the use of poison a good tool for wildlife management and predator control?
6. Is it good to introduce an exotic species into an environment?

There is enough information provided in the article to enable a student to form opinions and answers concerning the six questions. The article ends with a brief encouragement to the student to form more definitive opinions and answers by engaging in research and by putting the Activity Cards of the unit into play, in case he has not yet used them.

In discussing this article with your students, you might like to add some interesting and contemporary information, specifically as concerns the whooping crane (pertinent to the **Extinction, Natural and Otherwise** part of the article) and the monk parrot (pertinent to the **Exotic Species** part of the article).

**The Whooping Crane** The Aransas Wildlife Refuge is located on the coast of Texas. Near it is Matagorda Island, a five-mile long, 50,000 acre tract in southern San Antonio Bay and the Gulf of Mexico. From 1942 until 1975, the United States Army Air Force intermittently used Matagorda Island as a site for practicing test bombing. Although Matagorda Island, like Aransas, was known to be a winter habitat of the rare whooping crane, it seemed for a very long time that the needs of war would take precedence over the survival of the whooping cranes.

Fifty-five whooping cranes returned to their winter quarters at Aransas in 1973, but in the autumn of 1974 only forty-six reappeared. Although Air Force personnel said that their test bombs were not explosive, ecologists at the Aransas Wildlife Refuge and conservationists everywhere—who had previously put up an unsuccessful fight to stop the dredging for oyster shells in Aransas—again joined together in protest.

By early January, 1975, Defense Secretary Schlesinger—who, your students will be interested to know, is a birdwatcher—ordered the Air Force to do its practice bombing only from June to September, a time when these rare birds are annually nesting in Canada. Mention to your students that the fate of the crane is, however, still uncertain. The students should check the media for continuing reports. At present, the Air Force plans to dispose of Matagorda as a "surplus property." The Department of the Interior wants Matagorda as an extension of the Aransas Refuge, and the state of Texas wants it to be developed for recreational uses.

**The Monk Parrot** When your students read that the "total impact of any new species upon the living and non-living things which comprise an environment must be understood first" before an exotic species is introduced, tell them the story of the monk parrot. It is really a species of parrot, not, as people who purchased this native of South America for a pet once thought, a parakeet. A flock of this species escaped from shipping crates at Kennedy Airport in 1969. They joined hundreds of other escapees that had been brought into this country as pets. In 1968, for example, 12,000 monk parrots were legally imported. Today, the monk parrot flourishes outdoors in New Jersey, New York, Michigan, North Dakota, Virginia, and probably in other states where this agricultural menace hasn't yet been noticed. The bird is about a foot long and is completely green, not multi-colored like many other parrot species.

The monk parrot is known to drive native birds away from the feeding stations which people set up for them in winter. It will tease and worry dogs and cats, too, but most menacing of all is its ravaging impact on crops of fruit and grain. In some parts of South America, where the monk parrot is very abundant, as much as 45 percent of a crop can be ruined. The custom of these birds is to take little bites out of a series of foodstuffs—thus destroying the value of them all. Even the membership of the National Audubon Society is split on what should be done to eliminate this pest or reduce its negative environmental impact.

**Booklet Article – The Tools of Wildlife Management**

Students inevitably ask questions such as what it means to "manage" wildlife or how endangered species can be protected from extinction due either to competition with rival species (including man) or to environmental resistance factors. This article identifies sequentially the steps to action which a wildlife manager—or any ecologist studying a particular species—would undertake: **Inventory, Maintenance, Improvement, Restoration, and Proper Use.**

As you discuss the **Inventory** part of the article, encourage your students to try, on their own, the **Estimating Insect Populations** activity on pages 32 and 33 of their booklets. Or, if you prefer, you can do the population sampling as a whole-class activity, should time and season permit.

**Activity Card 6 – Visiting a Hatchery**

This card is an extension of the **Restoration** section of the booklet article identified above. It encourages students to visit a site such as where trout, bass, pheasant, or quail are raised specifically to be released later for fishermen or hunters. The card suggests alternate field experiences, too. They all concern man's deliberate control of animal populations for his exclusive use—for food, pets, scientific research, and clothing.

**Activity Card 7 – Doing Research on Exotic Species**

An extension of the **Exotic Species** part of **The Tools of Wildlife Management** article, this card identifies some aliens that have impacted upon environments new to them and structures the appropriate inquiry that can be made about such species.

**Activity Card 8 – Judging the Laws That Protect and Preserve**

The three sections of this two-card exploration into the legal sphere of wildlife management enable the student: (1) to evaluate existing laws in the context of **when they were passed**, (2) to propose a relevant contemporary bill, and (3) to rank the wildlife protection accomplishments of the 93rd Congress, according to the student's own opinion of their importance.

## SECTION IV A KEY CONTROVERSY: LAND USE

### FOCUS

Are we running out of open space in the United States today? How serious is the problem of competition between people and wildlife for open space? Why are ecologists saying that good land use is the most fundamental of all environmental objectives?

Answers to these questions will evolve from Section IV as your students see the second filmstrip and read about the land use facts and the land development problems that are presented in the **Student Resource Booklet**. Provision is also made in this section for students to investigate and evaluate their own environments on community, county, or state levels.

The second filmstrip of this unit, **Don't Fence Me In, A Story of Shrinking Spaces**, contains two parts. It is recommended that you use the filmstrip twice in this section. First, use Part A to introduce the land use issues. Later, replay the filmstrip, showing both Part A and Part B to summarize this section and introduce the final section of the unit.

Information on **Preparing an Environmental Impact Statement** is provided for you at the end of Section IV as a supplement to the problems and issues treated herein. Use it either to inform your students about the Environmental Policy Act of 1969, which initiated the policy of preparing impact statements, or have them prepare an Environmental Impact Statement (E.I.S.), analyzing a specific land use project that may be under development in your locale.

### THE MATERIALS PROVIDED

| Student Booklet | Audio-Visual Materials | Ecomaster Activities | Extension Activities |
|---|---|---|---|
| **Facts on Use in the United States**<br><br>**Development or Open Lands** | **Filmstrip 2, Part A**<br>Don't Fence Me in, A Story of Shrinking Spaces<br><br>**Audio Cassette Side B** | **Worksheet 6**<br>Land Development in Your Area | **Activity Card 9**<br>Recreation Choices and Open Spaces<br><br>**Activity Card 10**<br>Preserving Open Space: Values and Opinions in Your Area |

### MAKING THE MATERIALS WORK, SUGGESTIONS FOR THE TEACHER

**Filmstrip 2 – Don't Fence Me In, A Story of Shrinking Spaces** The filmstrip begins by stating that a person's answer to the question, "Are we running out of open space in the United States today?" is very likely to be conditioned by where he lives and by what he

understands open space to mean. It is true that most of the land area in the United States—which is about 2,266 million acres in all—has not been developed for purposes such as cities, roads, or airports. About 90 percent of the total land area can be thought of as still open. This is the land area that now supports forests, crops, cattle, and many species of wildlife. About 3 percent of the 90 percent accounts for regulated open space such as the state and national parks and forests.

The filmstrip identifies these open space problems and then encourages discussion of how to solve them in the United States today:

1. *Increasing urbanization and an increasing human population* So far, these two factors have been causing the habitat displacement of other species; the pollution of the air, land, and water; and the loss to people of a feeling that we too are a part of nature.

2. *Over-use of regulated open space such as the state and national parks and forests* The filmstrip points out that since 1967, when the national forests alone were visited by more than 150 million people, more and more people—from 8 to 10 percent more every year—have been using and misusing these resources.

3. *The environmental impact of strip-mining, particularly in this time of energy crisis* Students are informed that half of all the coal mined in the United States in the early 1970's was mined by this environmentally harmful method.

4. *The environmental impact of tampering with the wetlands by ditching them, draining them, or dousing them with pesticides* The filmstrip explains the many values of wetlands and informs students that over a third of the original 127 million acres of wetlands in the United States have already been destroyed. Part A concludes by asking the students, "Do you know how you can help to solve these problems?"

**Booklet Article — Facts on Land Use in the United States**

This fact sheet reinforces information presented by Part A of the second filmstrip and adds further data to motivate discussion. Be sure your students understand that there is no single definitive answer to the question "What is good land use?" Explain to them that good land use—like good predator control programs and good game laws—must involve careful decisions made on a situation-to-situation basis, after all the priorities of cause and effect have been weighed.

Concerning item number 1 of the fact sheet, you might like to mention that surveyors and geographers include in total acreage figures water flow areas less than 220 yards in width and water bodies less than 40 acres in area. Item number 2 further accounts for these by stating that 6 percent of the total "land" area consists of water flow areas and small bodies of water. In order for the students to get a visual picture of the proportional uses of land in terms of the total land area, you might construct a simple pie graph or a bar graph on the chalkboard as they are figuring out the actual number of acres attributed to each use.

Item number 5 should motivate discussion among the students concerning wise use of our regulated open space resources. The students who have visited such places will probably be willing to share their experiences and opinions with others. During the mid-1970's more than 200 million people visited the national forests and national parks. (You probably should mention that one particular family, for example of four members, might visit three state parks—or the same one three times—and one national forest in the course of a typical vacation week, and this would account for 16 of the 200 million-plus who annually visit the regulated open space resources.) Item number 6 should also elicit free response and discussion.

**Booklet Article – Development or Open Lands? and Worksheet 6 – Land Development in Your Area**

Next have your students read this article. It highlights the specific development problems that apply to floodplains and to urban areas. It also encourages them, at the end of the article, to undertake the idea-sharing activities which are listed there. These three optional activities can be fun, stimulating creative response. They also stimulate an understanding of the needs and wishes that we express when we make evaluations of open space.

Distribute copies of the Ecomaster, **Land Development in Your Area**. This open-ended worksheet structures exploration of the students' own environment, specifically as concerns floodplains, urbanization, and open space resources. You might like to divide the class into three groups, each responsible for getting and then presenting information to the rest of the class on one of the three categories; or you might prefer to assign the students to do any two of the activities suggested under each one of the three categories.

**Activity Card 9 – Recreation Choices and Open Space and Activity Card 10 – Preserving Open Space: Attitudes and Opinions in Your Area**

> An individual student can elect to do one or both of these activities by himself; however, you really should encourage the members of your class to borrow these cards and use them to get reactions from students who have not been exposed to the **Open Lands and Wildlife** unit and from adult members of their family and community. They may be pleasantly or unpleasantly surprised by the economic, ecological, and recreational priorities of other people and eager to share the reactions they get with the rest of the class.
>
> If you live in a farming area, encourage the students to interview local farmers concerning the problems they face today. If farming has been decreasing every year in your region, have the students find out why. They can write to their State Department of Agriculture for information.

For your information, the increase in dollar value of much farmland has caused many open-space farm areas near suburban or urban centers to become developed. In southern New England, for example, farmland has increased 100 percent in value since 1967. The number of operating farms in Connecticut dropped from 8,266 in 1959 to only 4,500 in 1972.

Many states today have laws encouraging open space preservation. New Jersey, New York, Pennsylvania, California, New Hampshire, and Connecticut have laws to provide for differential assessment of certain types of open space areas. Encourage students to find out about open space laws.

### Preparing an Environmental Impact Statement

The Environmental Policy Act of 1969 officially established the practice of evaluating the effects of man's changes on the environment. An environmental impact statement (E.I.S.) is a report which examines a proposed project in detail. A project which may significantly affect the quality of the environment (such as mining in a National Forest) needs study. Mining brings benefits as well as costs to man. The purpose for preparing an E.I.S. is to weigh the values of a project against the damage it may do. Damage can include spoiling the scenery, killing animals on the endangered list, or any other harmful result. The evaluation of a project should be done by many professionals including ecologists, engineers, social scientists, and planners. After examining a completed E.I.S., governmental officials decide whether or not to allow the project to be carried out.

Usually a series of steps takes place in the preparation of an E.I.S.:

1. The objective of the project is stated.
2. The technology necessary to accomplish the objective is studied.
3. One or more alternative ways to achieve the objective are proposed.
4. The characteristics of the existing environment (before the proposed project) are described.
5. The benefits and costs in money are itemized for each alternative way of meeting the objective.
6. The environmental impact of each alternative is predicted.
7. The separate actions involved in the project are listed and their effects upon various parts of the environment are determined.
8. A summary and list of recommendations are made at the end of the report.

Environmental impact considers **how much** the project will affect different parts of the environment. It also considers **how important** this change will be. Usually, the "how much" and the "how important" questions are expressed in numbers as well as in writing. A proposed mining project in a National Forest can have an effect on an endangered species that might be rated "5" on a scale of 1 to 10. If the importance of this animal is considered great, the evaluators might assign a "10." One way to express these two parts of environmental impact on an endangered species is "5/10."

**Student Activity:** Select a current environmental issue which involves a specific land use project. Have the students prepare an E.I.S. and make a decision about whether or not the project should be allowed.

For further information about Environmental Impact Statements:

*A Procedure for Evaluating Environmental Impact* by Luna B. Leopold, et. al. Geological Survey Circular 645 Washington, D.C. 1971 (free) Small quantities are available from Distribution Section, U. S. Geological Survey, 1200 South Eads Street, Arlington, Virginia 22202

*Environmental Impact Assessment: A Procedure* by Lloyd V. Stover. Pottstown, Pennsylvania: Technical Publications Section, Sanders and Thomas, Inc. 1973. Available from the Public Relations Department of STV, Inc., Consulting Engineers, First Federal Building, Pottstown, Pennsylvania 19464

## SECTION V HOW YOU CAN HELP

### FOCUS

This final section of the unit encourages action for the purpose of conservation ecology and wildlife protection. Ways in which students can become involved as individuals and as members of a group or a class are identified for them here. Part B of the second filmstrip, the two booklet articles, and the lists of "Groups to Contact and Support" in the Appendix of their booklets are intended to be motivational. In addition, this final section of your Guide provides you with career information which you can supply to interested students, and identifies some good films and filmstrips that you might like to obtain.

### THE MATERIALS PROVIDED

| Student Booklet | Audio-Visual Materials | Ecomaster Activities | Extension Activities |
|---|---|---|---|
| Helping a Threatened Population<br><br>Suggested Strategies for Action<br><br>Appendix of Information | Filmstrip 2, Part B<br>How You Can Help | | |

### MAKING THE MATERIALS WORK, SUGGESTIONS FOR THE TEACHER

**Filmstrip 2, Part B – How You Can Help** The presentation of this visual begins by asking students, "Do you have to wait until you are old enough to vote to help save open space and wildlife?" Then an answer is immediately and emphatically given, "No! There are many things you can do to help now. Often it takes only good planning and human energy to make a difference."

Described for the students are the educational values of visiting places such as game farms and fish hatcheries (**Note: Activity Card 6**) and making their own experiments in habitat improvement for the local species of wildlife. Good projects and experiments that can be undertaken are then shown.

**Booklet Articles – Helping a Threatened Population: A Model for Action–and–Suggested Strategies for Action**

A story is told in the first article about a real group of students and the steps they took to help the bluebird population in their part of Illinois to increase. The sequence of the activities in which these students participated is presented in order to show the steps to

action which your students can follow as they choose and then structure a project of their own. Students who want to learn more about ecology on a first-hand basis can elect one or more of the projects shown in the filmstrip or listed in their booklets as **Strategies for Action**.

It is recommended that before you conclude the *formal* part of this unit and begin to undertake projects *in the field*, distribute fresh copies of the first Ecomaster and have students take the **Attitudes and Values Assessment** again. Encourage them to examine their two sets of responses and determine what changes were made, and why. Also, review with them the **Ecology Glossary** on pages 34 and 35 of their booklets, to determine that they have learned the definitions of these terms and how to use them.

**For Further Reference:**

> Detailed plans for bluebird houses and tips on locating them are available at a cost of $.10 from Office of Secretary, Purple Martins and Bluebirds of America, Inc., 611 South Water Street, Crawfordsville, Indiana, 47933.

**Career Information for Students**

It should be explained to students that the careers in conservation and management of open lands and their wildlife inhabitants are many-sided. However, a student's career desires may not be realized if his view is romantic or impractical. For example, the Professional Training Committee of The Wildlife Society has established these minimum requirements for a Bachelor's degree program in conservation education: 30 semester hours in the biological sciences, including 6 hours for **wildlife management** or **wildlife biology**, at least 6 hours in **vertebrate biology** and **classification**, at least 9 hours in other **zoology** subjects, and at least 9 hours in **botany** and related plant sciences. Also, the usual course requirements at most colleges and universities for conservation education include another 15 required credits in sciences such as **chemistry**, **physics**, **mathematics**, **soils**, or **geology**.

With proper education, there is a wide career choice open today, such as these jobs which are identified below:

**Wildlife management biologist** – *works directly with wild animals and their environments* A manager may become a specialist in upland game, waterfowl, big game, furbearing animals, or fish. He can manage a wildlife refuge or public game area, make surveys, restore marshes, and improve lakes or streams.

**Wildlife research biologist** – *does basic research to obtain facts* A researcher provides the field workers and the information specialists with up-to-date information on taxonomy, physiology, genetics, behavior, disease, nutrition, population dynamics, pollution, chemistry, land use changes, and biocides.

**Enforcement officer** – *assures that wildlife laws and regulations are observed* An officer today is more than a game warden; he is a year-round educator as well.

**Educator** – *teaches wildlife conservation at junior high, high school, or college level* An educator can also teach for a state or local conservation center, or for industrial or citizen groups.

**Information specialist** – *interprets both research facts and field situations for the general public* A communicator can write articles or pamphlets, take pictures, give speeches, or contribute his unique talents to the development of newspaper, magazine, radio, or television presentations about wildlife.

**Recreation and resources planner** – *provides for people's outdoor needs and interests* A consultant, planner, or naturalist is in big demand today where people realize the need for well-balanced planning in any projected use of the environment.

## FILMS AND FILMSTRIPS ABOUT OPEN LANDS AND WILDLIFE

**"Urban Sprawl Vs. Planned Growth" 21½ min.** The story of land development with a focus on maintaining natural beauty.

**"The Green City" 23 min.** How to preserve green space and open space in urban areas.

Available: Stuart Finley, Inc.
3428 Mansfield Road
Falls Church, Virginia 22041

**Ecology of the United States Series** A series of short films each covering a part of the ecological system including swamp, plateaus, desert, arctic, prairie, ponds, ocean, and forests.

Available: Oxford Films
1136 North LasPalmas Avenue
Los Angeles, Calif. 90038

**"Alaska: End of the Last Frontier"** How man is changing one of Earth's last great wilderness areas.

Available: ABC Media Concepts
4151 Prospect Avenue
Los Angeles, Calif. 90027

**"The Gifts" 28 min.** Documentary film about the American landscape depicting the environmental degradation that has occurred over the last two centuries.

Available: Modern Talking Picture Service, Inc.
160 East Grand Avenue
Chicago, Illinois 60611

**"Look to the Land" 21 min. $9.00 Rental – "Man's Impact on the Environment" 23 min. $8.00 Rental** Two films which document man's misuse of the environment.

Available: Indiana University
Audio-Visual Center
Bloomington, Indiana 47401

**"The Empty Nest" 20 min. $25.00 Rental** Tells the story of the threatened extinction of the osprey.

**"The Animals Are Crying" 15 min. $15.00 Rental** A documentary describing the overpopulation of dogs and cats and what is being done about the problem.

**"The End of One" 7 min. $15.00 Rental** A film without narration showing seagulls raiding a dump while one lone, sick bird struggles and dies.

Available: Learning Corporation of America
711 Fifth Avenue
New York, N. Y. 10022

**"Balance in Nature" 17 min.** The system of biological control is exemplified by the aphid and the ladybird beetle.

Available: Charles Cahill and Associates, Inc.
P.O. Box 3220
Hollywood, Calif. 90028

**"Populations" 15½ min.** Deals with physical factors, natural controls, and the effects of overcrowding on populations.

**"What Ecologists Do." 15½ min.** Explains the roles of ecologists in studying organisms and their environment. Includes a sequence on the bald eagle and pesticides.

Available: Centron Educational Films
1621 West Ninth Street
Lawrence, Kansas 66044

**"Endangered Species" and "Incident at Santa Barbara"** Two color and sound filmstrips with teacher's guide showing man's impact on the environment.

Available: Teaching Resources Films
Station Plaza
Bedford Hills, N. Y. 10507

**"Ecology at Work: The Case of the Bighorn Sheep"** Two sound filmstrips probing the problems associated with bighorn sheep and how an ecologist helps them. Includes a teacher's guide.

Available: Warren Schloat Productions, Inc.
Pleasantville, N. Y. 10570

**"Vanished and Vanishing Species"** Four color filmstrip series with four records or four cassettes concerned with the rapid rate of extinction. With records, $52.00 – With cassettes, $60.00.

Available: AIMS Instructional Media Services, Inc.
P.O. Box 1010
Hollywood, Calif. 90028

**"Kingdom of the Animals"** Five sound filmstrip units, running time 16–20 minutes each. Including, "Africa,""Insects,""Reptiles," "Chimpanzees," and "Wildlife: Vanishing American Heritage." $67.50

Available: National Geographic Society
Washington, D. C. 20036

## KIT INVENTORY FOR OPEN LANDS AND WILDLIFE

| | |
|---|---|
| 1 | Teacher's Guide |
| 30 | Student Resource Booklets |
| 12 | Ecomasters (6 Activities,* 2 sheets of Culprit Cards, and the 2-page Unit Test) |
| 4 | Overhead Transparencies |
| 10 | Activity Cards |
| 3 | Filmstrips |
| 1 | Audio Cassette (recorded on Side A and Side B) |

*2 of which are 2-page Activities

## ANSWERS TO THE UNIT TEST

| | | | |
|---|---|---|---|
| 1. b | 6. d | 11. a | 16. b |
| 2. c | 7. b | 12. c | 17. a |
| 3. b | 8. d | 13. d | 18. b |
| 4. c | 9. c | 14. b | 19. a |
| 5. a | 10. b | 15. c | 20. d |

| SECTIONS OF THE UNIT | STUDENT RESOURCE BOOKLET | COMPONENTS TO COORDINATE WITH RESOURCE BOOKLET | | |
|---|---|---|---|---|
| | | Audio-Visual Materials | Ecomaster Activities | Extension Activities |
| Attitudes and Values | Preface to the Unit<br>Dead or Alive, A Story | **Filmstrip 1**<br>Why Wildlife?<br>**Audio Cassette, Side A** | **Worksheet 1**<br>Attitudes and Values Assessment (2 pages) | **Activity Card 1**<br>Learning About Endangered Species |
| Finding Out by Looking Closely | A Woodland Mystery<br>Hints for Observing Birds<br>Wildlife Detective Game: The Evidence | **Wildlife Detective Game: The Culprit Cards** | **Worksheet 2**<br>Observation Guide for Animal Study<br>**Worksheet 3**<br>Wildlife Detective Game: The Clues | **Activity Card 2**<br>Counting the Animals In Soil Samples<br>**Activity Card 3**<br>How Do Insects Move and Navigate?<br>**Activity Card 4**<br>Observing the Behavior of People<br>**Activity Card 5**<br>More Uses for the Wildlife Detective Materials |
| Learning About Ecology | A Year in the Life of a Twin Fawn<br>Ecology: Principles and Problems<br>The Tools of Wildlife Management | **Overhead Transparencies**<br>Habitat, Range, and Territory<br>Biotic Community<br>Producers, Consumers, and Decomposers<br>Ecological Balance | **Worksheet 4**<br>Where Do Pill Bugs and Sow Bugs Live? (2 pages)<br>**Worksheet 5**<br>Toothpick-Eating Animals | **Activity Card 6**<br>Visiting a Hatchery<br>**Activity Card 7**<br>Doing Research on Exotic Species<br>**Activity Card 8**<br>Judging the Laws That Protect and Preserve |
| A Key Controversy: Land Use | Facts on Land Use in the United States<br>Development or Open Lands? | **Filmstrip 2, Part A**<br>Don't Fence Me In, A Story of Shrinking Spaces<br>**Audio Cassette: Side B** | **Worksheet 6**<br>Land Development in Your Area | **Activity Card 9**<br>Recreation Choices and Open Spaces<br>**Activity Card 10**<br>Preserving Open Space: Values and Opinions in Your Area |
| How You Can Help | Helping a Threatened Population<br>Suggested Strategies for Action<br>Appendix of Information | **Filmstrip 2, Part B**<br>How You Can Help | | |